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Going for It on Fourth Down: Rivalry Increases Risk-taking, Physiological Arousal, and Promotion Focus

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GOING FOR IT ON FOURTH DOWN: RIVALRY INCREASES RISK-TAKING, PHYSIOLOGICAL AROUSAL, AND PROMOTION FOCUS

Abstract

Risk-taking is fundamental to organizational decision-making. Extending prior work that has identified individual and situational antecedents of risk-taking, we explore a significant relational antecedent of risk-taking: rivalry. In both a field setting and a laboratory experiment, we describe how a competitor's identity and relationship with the decision-maker influences risk-taking. We analyze play-by-play archival data from the National Football League and find that interactions with rival (versus non-rival) partners' increases risky behavior. In a laboratory experiment involving face-to-face competition, we demonstrate that rivalry increases risk-taking via two pathways: increased promotion focus and physiological arousal. These findings highlight the importance of incorporating relational characteristics to understand risk-taking. Our findings also advance our understanding of when and why competition promotes risk-taking, and underscore the importance of identity and relationships in the psychology and physiology of competitive decision-making in organizations.

Keywords: risk-taking, regulatory focus, competition, rivalry, arousal

Attitudes towards risk constitute a fundamental building block for how individuals, groups, and organizations make decisions (March & Shapira, 1987). Such attitudes underlie a wide range of decisions from hiring and investment decisions (Malhotra, 2010; Olian & Rynes, 1984; Scholer, Zou, Fujita, Stroessner, & Higgins, 2010; Staw, 1976; Zou, Scholer, & Higgins, 2014), to creative decisions (e.g., Amabile, 1988), and to interpersonal decisions, such as the decision to voice behaviors (e.g., Burris, 2012). As such, it is unsurprising that risk is a fundamental topic for management scholars.

Scholars in management, psychology, and economics have explored individual and situational characteristics that influence risk-taking. For example, scholars have found that individual characteristics, such as gender and experience, moderate risk-taking (Byrnes, Miller, & Schafer, 1999; Menkoff, Schmidt, & Brozynski, 2006), as do situational characteristics such as incentives (Hvide, 2002; Sanders & Hambrick, 2007; Wiseman & Gomez-Mejia, 1998) and the number of potential competitors (e.g., Boyd & de Nicolo, 2005). Further, risk-taking can vary

according to whether a decision-maker recently experienced a loss (Lehman & Hahn, 2013; Zou, Scholer, & Higgins, 2014), and whether the decision domain involves health versus financial concerns (Blais & Weber, 2006; Figner & Murphy, 2011).

Building upon recent trends in relational approaches to management research (e.g., Gelfand, Major, Raver, Nishii, & O'Brien, 2006; Grant, 2007; Wrzesniewski, Dutton, & Debebe, 2003), we apply a relational lens to the study of risk-taking. In particular, we investigate how rivalry (Kilduff, Elfenbein, & Staw, 2010), a unique social relationship that is common both within and between organizations, influences risk attitudes. Although prior research has linked rivalry to greater motivation (Kilduff, 2014) and unethical behavior absent of risk (Kilduff, Galinsky, Gallo, & Reade, 2016), it is unclear how rivalry will affect risk attitudes. Competition against a rival may trigger greater threat to one's sense of self-worth (Kilduff et al., 2016), cause actors to pursue more conservative and familiar strategies (Staw, Sandelands, & Dutton, 1981), and ultimately reduce risk-taking consistent with the 'threat rigidity hypothesis.' Across an archival study and a laboratory experiment, however, we find the opposite; rivalry increases risk-taking through two independent pathways: psychological (via increased promotion focus) and physiological (via increased arousal).

In this investigation, we make two key theoretical contributions. First, we introduce a relational lens to understand risk-taking. Through this relational lens, we integrate regulatory focus theory (Crowe & Higgins, 1997; Higgins, 1997, 1998) to develop a theoretical framework for conceptualizing risk-taking. Our findings reveal that individuals become more risk seeking when competing against a rival than when competing against a non-rival. These findings expand our understanding of the antecedents of risk-taking, and we integrate our investigation with related research that has begun to highlight the importance of relational factors to constructs such

as justice attitudes (Colquitt et al., 2013) and motivation (Grant, 2007). Importantly, our investigation also advances our understanding of regulatory focus theory. In contrast to prior work that has examined the role of regulatory focus in decisions made by individuals acting in isolation, a literature that emphasized dispositional and situational drivers, we identify the importance of relationships in interdependent decision-making contexts for regulatory focus.

In addition to this main theoretical contribution, we also contribute to the literature on rivalry. We contribute to rivalry theory by identifying risk-taking as an important consequence of rivalry, extending prior work linking rivalry to motivation (Kilduff, 2014), reduced deliberation in pursuit of goals (Converse & Reinhard, 2016), and unethical behavior (Kilduff et al., 2016). Furthermore, we highlight the role of increased promotion focus as a core psychological consequence of rivalry, which may provide a parsimonious framework that encompasses previously established mechanisms and outcomes of rivalry. We also highlight physiological arousal as a consequence of rivalry and explain its effects on risk-taking independent of the psychological mechanism of promotion focus, thus helping to answer the call for research to investigate the physiological roots of organizational behavior (Akinola, 2010).

ATTITUDES TOWARD RISK

Attitudes toward risk are an inherent feature of organizationally-relevant decision-making at the individual and organizational levels. For example, for individuals within organizations, the risk of social backlash can prevent them from voicing consequential and potentially fatal issues (e.g., Burris, 2012), and from helping fellow team members (e.g., Podsakoff, Ahearne, & MacKenzie, 1997), thus damaging team performance. At the organizational level, managers' risk attitudes underlie decisions to launch new technological and product related innovations in manufacturing (Greve, 2003) and can lead to a higher frequency of acquisitions (Thornton, 2001). Indeed, in an analysis of S&P 500 companies, CEOs' risk behaviors have been directly

linked to their firms' performance (Hayward & Hambrick, 1997; Sanders & Hambrick, 2007). A thorough understanding of risk-taking behavior is therefore of pressing concern for managers and organizational scholars alike. The extent to which a decision is risky is defined as the extent to which it has uncertain outcomes; holding expected value constant, a decision with higher variance in possible outcomes is riskier than a decision with lower variance in outcomes (March & Shapira, 1987; Weber, Shafir, & Blias, 2004).

Extant research has identified a number of factors that influence risk preferences (e.g., Loewenstein, Weber, & Hsee, 2001; Lopes, 1994). Traditionally, risk attitudes were conceptualized as a stable dispositional attribute, such that some people are risk-takers and others more cautious. Supporting this view, a variety of personality factors have been linked to risk-taking, including achievement motivation (Atkinson, 1964; Kogan & Wallach, 1964; McClelland, 1965), extraversion (Eysenck, 1976), impulsiveness (Eysenck & Eysenck, 1978), and sensation seeking (Zuckerman, 1979). For example, using a shuffleboard game, Atkinson, Bastian, Earl, and Litwin (1960) found that individuals' achievement motivation predicted their preference for riskier shots (i.e., more difficult shots with higher potential gains) over less risky shots (i.e., less difficult shots with lower potential gains). Other research has found a positive relationship between self-reported sensation seeking and financial risk-taking, such as playing the lottery or gambling (Horvath & Zuckerman, 1993). Demographic characteristics have also been associated with risk preferences; males (Wallach & Koonan, 1959) and younger (Slovic, 1966) individuals seek more risk on average.

A related, but distinct stream of research has identified situational factors that influence risk preferences. Much of this work is grounded in the rational actor and utility maximization models of behavior and focuses on incentives that are used as inputs into decision-makers' calculations of costs and benefits (Starmer, 2000; Wiseman & Gomez-Meija, 1998). For

example, Becker and Huselid (1992) found that increasing the prize differential between winners and non-winners in stock car racing promoted additional risk-taking by providing drivers with greater incentives to achieve high-ranking performance. In addition, Boyd and de Nicolo (2005) discuss how, when operating in concentrated markets, banks rationally optimize their portfolios by choosing higher risk projects to outperform their opponents.

Risk preferences are also influenced by a number of situational factors that bias decision-making, such as framing (Tversky & Kahneman, 1979) and the mood of the decision-maker (Kugler, Connolly, & Ordóñez, 2012; Mittal & Ross, 1998). For example, Kahneman and Tversky (1979) found that individuals were more risk seeking when alternatives were presented in negative (e.g., potential losses) rather than positive (e.g., potential gains) terms. This loss aversion effect occurs even when the stakes are high and the decision-makers have a great deal of experience (Pope & Schweitzer, 2011). Related work has examined how emotion affects risk preferences (Lowenstein, Weber, Hsee & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004). For example, fear promotes risk aversion, whereas anger promotes risk-taking (Lerner, Gonzalez, Small, & Fischoff, 2003; Lerner & Keltner, 2001). People also take greater risks when the potential outcomes of their decisions elicit strong affective reactions (such as a $5000 dream tour of Europe versus a $5000 tuition voucher; Rottenstreich & Hsee, 2001).

Here, we extend this extant work on risk-taking by applying a relational perspective to the study of risk. Relationships have been shown to have significant effects on a range of organizationally-relevant phenomena including justice attitudes (e.g., Colquitt et al., 2013), voice behaviors (e.g., Van Dyne et al., 2008), job design and motivation (Grant, 2007) and organizational citizenship behaviors (e.g., Chiaburu & Harrison, 2008). For example, disadvantageous inequity is perceived to be fairer when comparing one's self to a friend rather than an opponent (Sherf & Venkataramani, 2015). Further, practical trends highlight the

importance of relationships as 90% of U.S. employees and 73% of E.U. employees spend at least part of their work days in teams, thus creating frequent and meaningful interpersonal interactions (Gordon, 1992; European Foundation for the Improvement of Living and Working Conditions, 2010).

Drawing upon work on rivalry (e.g., Kilduff et al., 2010), we argue that actors' risk propensities can be influenced by their co-actors' identities and relationships with the decision-maker. Although much of the experimental work on risk-taking has focused on individual decision making in isolated contexts (e.g., Figner, Mackinlay, Wilkening, & Weber, 2009; Lerner et al., 2003; Zou et al., 2014)[1], in reality, the risky decisions that individuals make in organizational contexts are inherently social. For example, a manager facing a decision about whether to invest in a risky R&D venture or launch a new product line is likely to be influenced by existing relationships and prior interactions with other organizations in the industry as well as relationships with other managers within the organization. Indeed, a focus on the relationships that decision-makers have with their co-actors can be seen as an extension of the work on the situational determinants of risk because co-actors, and the relationships a decision-maker has with them, help to form the "situation" that the decision-maker experiences and reacts to (Buss & Craik, 1983; Mischel, 2004; Reis, 2009).

RIVALRY AND RISK TAKING

We conduct an initial investigation into whether and how relationships can affect risk-taking by examining the influence of rivalry on risky behavior. Rivalry is a unique, ongoing relationship that heightens the psychological stakes of competition and promotes a desire to win beyond the motivation induced by tangible stakes (Kilduff, 2014; Kilduff et al., 2010). In

[1] For a notable exception, see Steinberg (2004) for work on how teenagers increase risk-preferences in the presence of peers, thus suggesting risk-taking may respond to relational factors.

contrast to prior work in economics, psychology, and management that conceptualizes competition as a structural phenomenon that occurs when actors have opposing goals (Deutsch, 1949; Porter, 1980), or as the number of co-competitors (Boyd & De Nicolo, 2005; Garcia & Tor, 2009), rivalry theory emphasizes the relational nature of competition (Converse & Reinhard, 2016; Kilduff, 2014; Kilduff et al., 2010; Kilduff, Galinsky, Gallo, & Reade, 2016).

In addition to distinguishing rivalry from traditional competition, existing work on rivalry has revealed a number of insights into its origins and consequences. Rivalry emerges as a consequence of three aspects of the relationship between competitors: similarity, evenly-matched contests, and repeated competition. This is true for both organizations (university basketball teams; Kilduff et al., 2010) and individuals (adults from the general population and competitive runners; Kilduff, 2014), as well as third-party observers of competing groups (fans and consumers; Berendt & Uhrich, 2016; Converse & Reinhard, 2016). In terms of its behavioral consequences, actors exert greater effort when competing against rivals than non-rivals (Kilduff, 2014; Kilduff et al., 2010), are more action orientated (Converse & Reinhard, 2016), and are less ethical (Kilduff et al., 2016). Psychologically, rivals are more likely to view competitions as embedded in long-running narratives (Converse & Reinhard, 2016) and display greater concern for their social status vis-à-vis their rivals (Kilduff et al., 2016).

Rivalry serves as a good candidate for an initial investigation into the relational nature of risk-taking due to its commonality both within and between organizations. From the extant rivalry literature, it is unclear whether or not rivalry will promote risk-taking. Although recent work has linked rivalry with unethical behavior (Kilduff et al., 2016), research investigations of unethical behavior, including Kilduf et al., (2016), have largely considered contexts that are devoid of risk, such as lying under anonymity in which there was no risk of being found out

(Bryan, Adams, & Monin, 2013; Gino, Schweitzer, Mead & Ariely, 2011; Schweitzer, Ordóñez, & Douma, 2004). Similarly, scholars of risk-taking typically avoid confounds with unethical behavior by examining choices between alternatives without moral implications (Bechara, Damasio, Tranel, & Damasio, 2005; Figner et al., 2009; Lejuez et al., 2002). Indeed, many prototypical risky behaviors in organizations such as making financial investments (e.g., Ku, Malhotra, & Murnighan, 2005) and pursuing new products and technology (e.g., Sanders & Hambrick, 2007), generally lack ethical components. Further, in contrast to Kilduff et al. (2016) in which the unethical decisions provided actors with a clear competitive advantage, we focus on decisions in which the alternatives have equal or unclear advantages (i.e., the expected values for consequences are the same), which is also common to research on risk (Kahneman & Lovallo, 1993; Tversky & Kahneman 1979).

Thus, it is unclear how rivalry will affect the kind of amoral and performance-ambiguous risk-taking that risk researchers typically study. On the one hand, rivalry might reduce risk-taking. Competition against a rival can invoke greater concern about one's own sense of self-worth (Kilduff et al., 2016), which could cause competition against rivals to be more threatening due self-esteem concerns (e.g., Baumeister, Heatherton, & Tice, 1993; Blascovich, 2013). In turn, according to the 'threat rigidity hypothesis,' rivalry could reduce actors' appetite for risk by causing individuals and organizations to pursue more familiar, conservative strategies and eschew novel or riskier strategies that may leave them vulnerable (Staw, Sanelands, & Dutton, 1981). However, careful consideration of the psychology of rivalry and its potential physiological effects leads us to predict a positive effect of rivalry on risk-taking. We make this prediction for two primary reasons, both of which we investigate as mechanisms for a positive link between rivalry and risk-taking.

Rivalry and Regulatory Focus

Regulatory focus theory (Higgins, 1998) distinguishes between two strategies for goal attainment: Promotion focus and prevention focus. A promotion mindset reflects a focus on opportunities, goal attainment, and maximizing gains. In contrast, a prevention mindset reflects a focus on avoiding losses and preserving the status quo (Crowe & Higgins, 1997; Higgins, 1997).

Building upon prior work, we postulate that rivalry will trigger a promotion mindset. Kilduff (2014) observed that adults in the general population reported performing at a higher level when competing with their rivals, and that long-distance runners ran faster when in the presence of their rivals. Thus, rivals push one another toward greater levels of motivation and performance. This increased effort in the pursuit of maximum performance is consistent with a promotion mindset whereby individuals seek to maximize gains and attain their ideals (Crowe & Higgins, 1997). Furthermore, Converse and Reinhard (2016) found that rivals tend to view their contests with one another as embedded in a longer narrative, rather than as one-off contests, which fosters a more abstract and long-term mindset. Such long-term mindsets can lead to a greater focus on ideal outcomes (Converse & Reinhard, 2016; Trope & Liberman, 2003), which is consistent with the idea that rivalry invokes a promotion focus. Thus, building upon prior work which links rivalry to the pursuit of maximum performance (Kilduff, 2014) and eagerness (Converse & Reinhard, 2016), we explicitly test the link between rivalry and the broader, more fundamental decision making framework of regulatory focus (Higgins, 1997; 1998; Lanaj, Chang, & Johnson, 2012; Scholer & Higgins, 2008, 2013).

We expect a rivalry-induced promotion mindset to lead to greater risk-taking. Prior work has suggested that individuals high in promotion focus are more likely to take risks (Crowe & Higgins, 1997; Higgins, 2002) because a focus on the pursuit of gains increases tolerance for risk

(Förster, Higgins, & Bianco, 2003; Friedman & Förster, 2001). For instance, Crowe and Higgins (1997) had participants perform a recognition memory task in which participants were given a series of nonsense words and, after a filler task, had to indicate whether or not a nonsense word was found in a prior trial. They found that when instructions were framed with a promotion focus, participants demonstrated a "risky bias" by making more false positive errors. Furthermore, Förster and colleagues (2003) found that promotion-focused individuals used riskier strategies in pursuit of gains (e.g., pursuing more aggressive performance at the expense of reduced accuracy), whereas prevention focused participants used more cautious strategies that focused on avoiding losses (e.g., trading slower performance for increased accuracy).

Taken together, we predict that rivalry will induce increased promotion focus, which will mediate a positive effect of rivalry on risk taking.

Hypothesis 1: Individuals engage in increased risky behavior when competing against their rivals as compared to competing against non-rival opponents.

Hypothesis 2: Relative to competition against a non-rival, competition against a rival leads to a promotion mindset.

Hypothesis 3: An increased promotion focused will mediate the effect between rivalry and increased risk-taking.

Physiological Effects of Rivalry

In addition to promotion focus, we also examine the physiological effects of rivalry and whether they may serve as an additional pathway between rivalry and risk-taking. Rivalry increases the psychological stakes of a competition beyond the material stakes. For example, individuals who imagined competing against their rivals reported that such competitions carried greater status concerns and implications for their sense of self-worth (Kilduff et al., 2016). In addition, fans of professional football teams reported greater legacy concerns (i.e., "how one's

current performance will be remembered in the future" (p. 192) for contests against their team's rivals, because they perceived these contests as embedded within an ongoing competitive narrative, rather than as isolated events (Converse & Reinhard, 2016).

These increased psychological stakes associated with rivalry should in turn increase physiological arousal. With respect to status concerns, prior work finds that status threats increase arousal (Scheepers, 2009; Scheepers & Ellemers, 2005). For example, Scheepers (2009) found that intergroup status concerns, manipulated by creating the possibility for high status groups to lose their superiority to low status groups, led high status group members to experience increased blood pressure and pulse rates. Furthermore, situations that carry greater implications for one's sense of self-worth, in the form of identity concerns, have also been shown to increase arousal. As an example, social identity threats can increase blood pressure (Branscombe & Wann, 1992), and gender identity threats have been shown to increase cortisol, a common indicator of stress (Townsend, Major, Gangi, & Mendes, 2011).

We expect the increased arousal associated with rivalry to serve as a second pathway that promotes risky behavior. Arousal has been suggested to activate the behavioral activation response system (Fowles, 1980, 1988), which is characterized by disinhibition and impulsivity in goal pursuit (Carver & White, 1994; Gray, 1981, 1987; Newman & Wallace, 1993; Zuckerman, 1979). Such disinhibition should increase risk-taking by overloading deliberative cognition that might otherwise inhibit risk-taking (Loewenstein, 1996). Consistent with this, the arousal triggered by the prospect of delivering a public presentation (Mano, 1992, 1994) has been shown to promote risk-taking, and scholars have linked anger, a high arousal emotion (Berkowitz, 1990), with greater risk-taking (Lerner & Keltner, 2001).

Taken together, we hypothesize that competition against a rival will increase physiological arousal, which will in turn promote risk-taking.

Hypothesis 4: Relative to competition against a non-rival, competition against a rival increases physiological arousal.

Hypothesis 5: Physiological arousal will mediate the effect of rivalry and increased risk-taking.

Study 1: Rivalry in the National Football League

We first examine the link between rivalry and risk taking (Hypothesis 1) in a field context characterized by high stakes, competition, and expertise: The National Football League (NFL). This is an excellent setting to test our hypothesis for several reasons. First, this is a context where fierce rivalries exist and can be measured. Second, NFL games provide a clear measure of risk-taking that has been previously used by organizational scholars (see Lehman & Hahn, 2013). Third, the NFL is a multibillion dollar industry with high stakes competition for both the organizational decision-makers (coaches) and players; thus, decisions in this context are of great consequence. Fourth, football teams follow traditional conceptualizations of firms (e.g., Cyert & March, 1963; March & Simon, 1958). Each team is a goal-seeking entity comprised of distinct subunits (i.e., offense, defense, and special teams), each with their own set of managers or coaches. In addition, information is continually collected and updated throughout the game, ultimately making its way to a centralized decision-maker, a decision making process observed in a wide-variety of settings. Furthermore, over time, football teams can develop core, distinctive, and enduring identities which describe the character of their organization (e.g., the hard-nosed persona of the Pittsburgh Steelers). Overall, the availability of behavioral measures in high stakes settings has made professional athletics a common field setting for organizational scholars (e.g., Carton & Rosette, 2011; Day, Gordon, & Fink, 2012; Marr & Thau, 2014).

Setting and Sample

Our sample consisted of the complete play-by-play data of all NFL regular season games from 2002 to 2010 (16 games across 32 teams per year; 485,684 unique plays from 2048 unique games). The data were obtained through www.footballoutsiders.com, which provided a coded dataset based on raw play-by-play text transcripts from ESPN.com.[2] The coded data included play-level variables such as the play type, time remaining, and outcome of the play. We supplemented these data with team-level and game-level variables, including team rankings, week of the season from ESPN.com, and our independent variable of rivalry.

Dependent Variables

We focused our analyses on two behaviors that clearly reflect risk-taking in football: Two point attempts and fourth down attempts.

Two Point Attempts. After scoring a touchdown, a team makes a decision between two options: (a) Attempt to kick the ball between the goal posts for one point, or (b) attempt to move the ball into the end zone from three yards out for two points. In our sample, teams successfully converted one point attempts 98.56% of the time and successfully converted two point attempts 45.68% of the time. Thus, this decision represents a classic choice between a high probability, low variance option (98.56% chance of earning one point; *SD* = 49.99%) versus a lower probability, higher variance option (45.68% chance of earning two points; *SD* = 49.87%) – with roughly equal expected values. Within our sample, teams attempted to go for two points 4.95% of the time, suggesting this is a less used and riskier option. All plays after a touchdown were coded as either "0," representing the low risk option of kicking, or "1," representing the risky option of "going for two."

[2] The authors personally thank Aaron Schatz for providing access to these data.

Fourth Down Attempts. In football, the team in possession of the ball (the offense) has four attempts, or 'downs,' to advance the ball by 10 yards (with the eventual goal of reaching the end zone and scoring a 'touchdown,' worth six points with a chance to earn one or two additional points). If the offense is successful in gaining 10 or more yards, they are awarded a new set of four downs; if they are unsuccessful, possession of the football transfers to the opposing team.

On each fourth down, the offense faces an important choice between two options. The typical and more conservative option is to kick the ball and yield possession of the ball to the opponent (i.e., attempt a field-goal or punt the ball). By doing so, the offense loses the opportunity to score a touchdown, but also makes it harder for their opponent by forcing them to travel a farther distance to score. The risky option is to "go for it" by attempting to advance the ball and gain a fresh set of downs. If this is successful, the offense maintains possession of the football and keeps alive the opportunity to score a touchdown. However, if they fail, this makes it significantly easier for the opponent to score by giving them a shorter distance to travel. Within our sample, teams "went for it" 12.14% of the time and were successful on 51.17% of those attempts. All fourth down plays in our dataset were coded as either "0," representing the low risk option (i.e., attempting a field goal or punting the ball; success rates being 99.24%[3]), or "1," representing the risky option (i.e., attempting a fourth down conversion or "going for it").

We focused our investigation on these behaviors for the following reasons. First, compared to other measures (e.g., attempting a long pass) these two measures offer the clearest binary choice between a high risk option and a low risk option, thus providing a face-valid and intuitive measure of risk-taking. Indeed, prior scholars have used fourth down attempts as a measure of organizational risk-taking (Lehman & Hahn, 2013). Second, decisions to attempt to

[3] Any punt that was not blocked was considered to be "successful". By this definition, punts were successful 99.46% of the time, whereas field goals were successful 81.23% of the time.

gain two points (versus gain one point) or to convert on a fourth down (versus punt or kick a field goal) are common in every NFL game. In our sample, we have 35,870 Fourth Down decisions and 11,076 Two Point decisions. This large sample provided plenty of statistical power to test our hypotheses.

In spite of the prior precedent and face validity of these measures, we conducted a pilot study to confirm our conceptualization of the risk inherent in these decisions. We recruited 100 NFL fans from Amazon's Mechanical Turk by posting a job specifically asking for NFL fans. Participants were asked to rate the riskiness of fourth down attempts and a two-point attempts on a 7-point scale (e.g., "How risky would you rate going for it on fourth down?"): 1 (Not risky) to 7 (Very risky). Both measures were rated significantly above the midpoint of four (two point attempts: $M = 4.84$, $t(99) = 7.19$, $p < .001$; fourth down attempts: $M = 5.53$, $t(99) = 14.86$, $p < .001$), thus suggesting our measures are risky.

Independent Variables

We assessed the intensity of rivalry between pairs of teams in three different ways.

Rivalry – NFL.com. First, we referenced a list of the top 10 NFL historical rivalries identified by the sports analysts at NFL.com. This list represents the opinions of experts who follow the NFL and its rivalries very closely, and was created in 2011, shortly after the endpoint of the time period we examined. We created a dummy variable to indicate if a pair of teams were present on this list ("0" if a pair of teams was not on the top 10 list; "1" if a pair of teams was on the top 10 list).

Rivalry – Google Search. Second, we counted the number of webpages returned in a Google.com query as a proxy for the strength of rivalry between each pair of teams. To obtain

this measure, we entered the same six search phrases[4] for each pair of teams into Google.com and counted the number of results returned for each phrase. That is, using the same phrasing for each pair of NFL teams, we counted the number of unique webpages that Google returned. We then summed the total number of webpages returned across all six search terms for each pair of teams and used this as measure of rivalry intensity. This measure provides an indication of the popularity or visibility of a given rivalry, and roughly captures public opinions of rivalries in the NFL.

Amazon Mechanical Turk. As a final measure of rivalry we recruited 100 self-reported NFL fans on Amazon's Mechanical Turk and, given that knowledge of rivalries required a comprehensive knowledge of the sport, screened them according to their answers on an eight question quiz on NFL history (e.g., "Which team had their quarterback sent to jail over a bulldog fighting scandal?", "Which team first introduced the wildcat to the NFL between 2000 to 2010?"). We then asked the 56 participants who answered at least six of the eight quiz questions correctly and passed an attention check to list what they believed to be the top five to ten NFL rivalries. For each rivalry they listed we asked them to provide an explanation of the rivalry. We then summed the number of votes for each pair of teams and used this as a continuous measure of the intensity of their rivalry.

Analytical Procedure

Our dependent variables contained relatively rare events: in our sample, two-point attempts had an occurrence rate of 4.95% (548 out of 11076), whereas fourth down attempts had occurred 12.14% (4356 out of 35870) of the time. Thus, we used rare-events logistic regression

[4] To illustrate the search phrases used, to assess the rivalry between the New York Jets and New England Patriots, we used the phrases: "Jets Patriots rivalry," "New York Jets New England Patriots rivalry," "Jets and Patriots rivalry," "New York Jets and New England Patriots rivalry," "Jets versus Patriots rivalry", and "New York Jets and New England Patriots rivalry."

at the play-level (0 = Non-risky choice, 1 = risky choice; King & Zeng, 2001a, 2001b). Results are similar using both rare-events and ordinary logit regression. In each model, we included a number of control variables from three levels: the team level, game level and play level.

Year and Team Fixed Effects

We employed fixed effects both at the year level and team level (Greene, 2003) to control for differences in innate risk-taking preferences between each organization (e.g., New York Jets versus New York Giants). Standard errors were clustered at the team level.

Game-Level Controls

Intra-conference and Intra-division Games. We created an indicator if the two opposing teams were in the same conference (1 = Same Conference; 0 = Different Conference), and another indicator if the two opposing teams were in the same division (1 = Same Division; 0 = Different Division). This controlled for the possibility that tangible stakes are higher in games between teams in the same conference and/or same division, as well as familiarity between teams, at least in terms of games played. Both factors could influence risk-taking.

Absolute and Relative Ability Level of the Teams. We obtained weekly ability rankings of each team from ESPN.com, which represented experts' opinions about the relative ability levels of the teams at each week in the season. Since all of our measures of risk taking involved decisions made by the team with possession of the ball, we controlled for that team's ranking and the difference in ranking between the team with the ball and the team on defense. These controls addressed the possibility that more skilled teams might have a higher chance of converting fourth downs or two point conversions, thus likely having engaged in these behaviors more often.

Crowding. Prior work suggests risk-taking increases with the number of potential competitors who can overtake an actors' rank position (Bothner, Kang, & Stuart, 2007). To control for this we used a variation of Bothner et al.'s (2007) crowding measure and computed the number of divisional teams who could potentially overtake a focal team's rank should the focal team perform poorly (i.e., lose) and the other team performs well (i.e., wins). This roughly captures the density of similarly ranked competitors.

Week of the Season. Prior research suggests that risk-taking increases as deadlines approach, such as the end of the season (Lehman, Hahn, Ramanujam, & Alge, 2011). To control for this we included the week of the season as a continuous measure from 1 to 17.

Play Level Controls

Offensive Yardline. We controlled for the position of the ball to account for the fact that the relative payoffs of risky behaviors may vary as a function of where the offensive team is on the field. For example, teams are much less likely to go for it on fourth down when they are close to their own end zones, due to the high costs that would come from failing to convert (i.e., giving the other team a high probability of scoring). We measured this in yards from end zone (e.g., 0 to 100); a higher number meant that a team was farther away from its end zone.

Yards to first down. For fourth down attempts, we controlled for the number of yards to a first down (or a touchdown in the case where the offensive team started that series of downs inside the opponent's 10-yard line). This control variable is important because teams are more likely to attempt to gain first downs via fourth down attempts when they are close to earning a first down.

Gap in Score and Gap in Score Squared. We controlled for the difference in score between the offense and defense because teams may be more or less risk-taking depending upon

the current score of the game. For instance, teams who are leading (positive gap in score) may be less likely to take risks than teams who are trailing (negative gap in score). We also included the second-order term to account for the possibility that teams take more risks when the game is close in terms of points.

Time Remaining. In order to control for the effect of time on risk taking, we used dummy variables for the quarter in which a play took place, and a continuous measure of the time remaining in a half. Risk-taking should increase as deadlines approach (Lehman et al., 2011), which may manifest itself during the fourth quarter when a game is about to end.

Home versus Away. Playing at a home stadium, as opposed to an away stadium, tends to increase testosterone (Carré, Muir, Belanger, & Putnam, 2006), which can increase risk-taking (Ronay, & Von Hippel, 2010). To control for this, we created a dummy variable to indicate whether or not the team deciding whether to take a risk was in their home stadium or an away stadium (0 = Away, 1 = Home).

Results

Table 1 displays descriptive statistics and correlations between our variables across the sample of fourth down plays, and Table 2 displays these for the sample of two-point conversions. Risk-taking was more likely to occur closer to the end of the season, consistent with what would be expected (Lehman et al., 2011). Further, as expected, fourth down attempts were more likely when teams were a short distance from converting a first down, and when they were farther away from their own end zone. Tests of variance inflation factors (VIFs) indicate no signs of multicollinearity as all VIFs were below 3, which is well below the recommended threshold of 10 (Aiken & West, 1991).

Insert Table 1 & 2 about here

Consistent with prior theory, rivalry was correlated with being in the same division and conference (Kilduff et al., 2010). More importantly, our three measures of rivalry were highly correlated, so we standardized them and combined them into an aggregate measure. Importantly, running our analyses with the individual measures does not change the interpretations of our results.

We ran separate rare-events logistic regressions for both of our dependent variables. As depicted in Models 1 and 2 of Table 3, without any controls, the aggregate measures of rivalry had a significant and positive relationship with going for it on fourth down ($\beta = .043$, $p < .001$) and attempted a two-point conversion after scoring a touchdown ($\beta = .100$, $p < .001$).[5] As depicted in Models 3 and 4, in full models including all controls, rivalry had a significant and positive relationship with going for it on fourth down ($\beta = .055$, $p < .001$) and attempting a two-point conversion after scoring a touchdown ($\beta = .084$, $p = .025$). Thus, teams were more likely to take risks when competing against their rivals, supporting Hypothesis 1.

Insert Table 3 about here

In Figure 1, we depict the predicted probabilities of each outcome for games against rivals as compared to non-rivals, using the NFL.com based binary measure of rivalry and setting covariates to their means. Across our dataset, teams that were competing against a non-rival were estimated to attempt two-point conversions 4.86% of the time after scoring a touchdown, controlling for all game-level, play-level, and team-level factors. By comparison, teams

[5] Running our models without fixed effects results in a non-significant relationship between rivalry and fourth down attempts or two-point conversions. This mimics our results in the correlation matrix. This is likely because risky moves vary across teams and years, and so our effect depends on reducing the variance in our dependent variables.

competing against rivals engaged in this risky behavior 6.67% of the time. This suggests that net of factors such as difference in score, time remaining and, competing against a rival increases the probability of a team taking the risk of attempting a two-point attempt by 37%. Similarly, a team competing against a non-rival was estimated to attempt a risky play on fourth down 12.10% of the time, versus 12.96% if it were competing against a rival, net of all game-level, player-level, and team-level factors. This suggests that a team is 7.11% more likely to "go for it" on fourth down when competing against a rival versus a non-rival.

Insert Figure 1 about here

To ensure the robustness of our findings, we conducted several robustness checks.[6] First, our results are robust if we adjust the operationalization of one of our dependent variables. In our main analyses just presented, we followed prior work (Lehman & Hahn, 2013) by examining teams' decisions on fourth down as dichotomous, more risky versus less risky. However, teams technically have four different options on fourth downs. They can attempt two different types of risky plays in an attempt to gain a first down – an ordinary play, or a trick-play (faking a punt or field-goal) – and they can attempt two different types of less risky plays – punt the ball or attempt a field-goal. We find that our effects are robust if we distinguish between these four types of plays, and re-run our analysis in a multinominal regression. Second, our results are robust if we adjust the operationalization of key control variables, including (a) removing the time dummy variables and controlling for time via the higher order interactions of our time-remaining variable (e.g., time-remaining squared and time-remaining cubed), and (b) treating week of the season with a series of dummy variables rather than as a continuous variable. Third,

[6] For full results of these supplemental analyses, please contact the first author.

our results remain robust when we include interactions between rivalry (a) time remaining, or (b) being ahead or behind in score. We discuss the results of exploratory analyses into interactions between rivalry and score in the general discussion. Finally, using the same models presented in Table 3, we did not find evidence of rivals being more likely to succeed in their risky attempts, thus addressing a possible alternative explanation whereby the expected value of the riskier options was higher in rivalry games as compared to non-rivalry games.

Discussion

Using a large dataset of observable risk-taking behavior, we identified a robust relationship between rivalry and risk-taking. NFL teams were significantly more likely to take risks when competing against their rivals than when competing against non-rivals. This was true for both two-point attempts and fourth down attempts, and these effects held while controlling for inter-team differences in risk-taking, tangible factors such as competing against a conference or divisional opponent, and other play-level factors such as time remaining, score, and yards to first down. Though the effect sizes are relatively small (rivalry increases two-point conversions by 37%, and fourth-down attempts by 7.11%), this study provides strong support for our main hypothesis, in a real-world context characterized by high stakes and significant consequences. In fact, the actions and decisions of professional football teams are highly strategic and carefully planned, making the observed effects especially notable. For example, the first 10-15 plays that each team runs in a game are typically 'scripted' or determined in advance of the game (Farmer, 2015).

Of course, due to the correlational nature of these data, we cannot definitively conclude that rivalry caused increased risk-taking. Given the historical stability of rivalry (e.g., Kilduff et al., 2010) versus the very short timeframe on which our dependent measures were assessed, it is

difficult to imagine that risk-taking led to greater rivalry than vice versa. However, the possibility remains that we failed to capture an important third variable with our controls. To address this, Study 2 involved a controlled experiment.

STUDY 2: Experimental Evidence of the Link between Rivalry and Risk Taking

In Study 2 we extended our investigation to explore the causal relationship between rivalry and risk-taking. We also examined the mediating mechanisms that link rivalry and risk-taking by measuring both the psychological (promotion mindset) and physiological (arousal) effects of rivalry. The latter included measures of heart rate and skin conductance response. Notably, this is the first rivalry study to our knowledge that pits existing rivals against one another, face-to-face, in a controlled experiment.

Participants and Design

Our target sample size was 80 participants per cell, and we succeeded in recruiting 149 undergraduate participants to a two-condition (rivalry and non-rival competition) behavioral laboratory study. This sample size provided us with a power level of .98 to detect large effects, and .91 to detect medium effects (both above the standard desired power level of .80 which would have required sample sizes of 52 and 128 respectively; Cohen, 1992). Given that we were bringing intense rivals together to compete face-to-face, whereas prior experiments on rivalry have involved scenarios or recall primes (e.g., Converse & Reinhard, 2016; Kilduff et al., 2016), we expected to find a large effect size for behavioral measures of risk-taking, and at least medium-sized effects for promotion focus and arousal.

We conducted our study at the University of Arizona (Arizona), and used Arizona State University (ASU) as the rival. Arizona and ASU share a long-standing competitive history dating back to 1899, are co-located within the same state (co-location being the strongest predictor of

rivalry; Kilduff et al., 2010; Tyler & Cobbs, 2014), and have experienced competitive parity in recent years. Indeed, in a recent empirical analysis, this rivalry was identified as the number one strongest collegiate rivalry in the U.S. (Tyler & Cobbs, 2014).

Participants were compensated with either $15 or $5 plus course credit for participation in a 20-minute experiment. In our experiment, participants played a competitive game against a confederate, who posed either as an ASU fan (i.e., rivalry condition) or a University of Colorado fan (i.e., non-rival competition condition). Colorado was chosen as the non-rival competitor because they compete within the same athletic conference as Arizona and ASU (the Pac-12) yet Colorado is the Pac-12 team whom Arizona fans feel the least rivalry (Tyler & Cobb, 2014).

We invited participants to take part in our study based on their responses to a pre-screening questionnaire. This questionnaire asked participants how much school spirit they felt toward their favorite university on scale from (1) Very Weak to (7) Very Strong, and how much rivalry they felt toward other universities within the Pac-12, including ASU and Colorado, on a scale from (1) Not at all to (7) Very much). For the main study, we recruited participants who strongly identified with their home university (consistent with prior intergroup competition research; Cikara, Botvinick, & Fiske, 2011), and who felt strong rivalry towards the rival university (at least six out of seven on both school spirit and rivalry toward ASU). These selection criteria ensured that we were truly studying the experience of rivalry. Indeed, prior research suggests that people appraise events (e.g., rivalry) from an intergroup perspective when they strongly identify with an in-group (Mackie, Silver, & Smith, 2004).

Out of 615 participants who successfully completed the pre-screen, 477 participants (78%) felt strong rivalry (6 or 7) toward ASU and 415 (68%) participants felt strong school spirit (6 or 7) towards Arizona. We invited the 365 (59%) who met both criteria to participate in our

study. These prescreening data indicated that the majority of students at Arizona both highly identify with their university and felt intense rivalry toward ASU, thus mitigating concerns that we might be examining a special subset of the population.

Procedure and Rivalry Manipulation

We contacted participants via email and asked them to arrive to the lab wearing an article of clothing from their favorite university, which was always the University of Arizona. We did this to increase their identification with their home university and heighten the effects of rivalry. Upon arriving, the participant was informed that their partner (the confederate) had already arrived, and was led into a private room before seeing the partner. In the private room, the experimenter applied the physiological sensors for our arousal measures (described below) and obtained a 30-second baseline by leaving participants alone and instructing them to relax. Afterwards, the experimenter brought the confederate, who was wearing identical physiological sensors, into the room.

Rivalry Manipulation. The confederate wore either an ASU hat (rival) or a University of Colorado hat (non-rival competition). Prior experiments have successfully used confederates dressed in university clothing as a manipulation to prime in-group and out-group identity (Gino, Ayal, & Ariely, 2009). In order to reduce suspicion, the confederate always mentioned that he/she was a Master's student in the accounting program at Arizona, but had completed his/her undergraduate studies at either ASU or Colorado. The gender of the confederate was matched to the gender of the participant.

The experimenter then delivered the instructions for the subsequent task (a risk-taking game described below), demonstrated an example of the game, and administered a comprehension check. To strengthen our manipulation, we asked participants (and confederates)

to complete a writing prime. They were asked to spend five minutes writing about the relationship between their favorite university (Arizona), and the favorite university of the person sitting across from them (ASU or University of Colorado). Participants were asked to elaborate on the history between the two universities, and to describe the current interactions between the universities, the athletic teams, their fans, and the students.

Following this, the participant competed against the confederate on the risk-taking task. After the game, the confederate and the participant were separated and the participant completed a questionnaire that included our measure of regulatory focus. We then removed the physiological sensors, debriefed and paid the participant.

Measures

Risk Taking. We used a variation the "hot" version of the Columbia Card Task (CCT; Figner et al., 2009), which has been widely used as a measure of risk-taking (e.g., Jamieson, Koslov, Nock, & Mendes, 2012; Panno, Lauriola, & Figner, 2013; Penolazzi, Gremigni, & Russo, 2012). The participant and the confederate each played five rounds of the game on a computer. On each round, participants saw 32 face down cards. Participants were informed that, of the 32 cards, 30 were "gain" cards and 2 were "loss" cards. They proceeded to turn these cards over, one at a time, and were free to stop at any time. For each "gain" card participants turned over, they earned 10 points; if they turned over a "loss" card, they lost all of the points they had earned for that round. Thus, the more cards a participant turned over, the greater the degree of risk he or she was taking (Figner et al., 2009).

To ensure uniformity in the experimental procedure, we programmed the game so that the participant played their five trials first. Afterwards, the confederate would play their five trials

and would always lose (i.e., scored fewer total points than the participant). This was done to isolate the effects of rivalry versus non-rival competition, independent of winning or losing.

In addition, to allow maximum expression of risk-taking, we followed Figner et al. (2009) by introducing "rigged-feedback" into our game. On four out of the five trials, participants never encountered a loss card until the fourth to last card (for empirical justification of this "rigged-feedback" in the CCT, see Figner et al., 2009). Thus, the maximum number of cards a participant could select before selecting a loss card was 28.[7] On the participant's second trial, the game was rigged to display a loss card after the fourth card to limit suspicion.[8] Our dependent measure was the total number of cards turned over across the four trials, excluding the rigged second trial (Overall $M = 75.14$, $SD = 17.72$). Prior to starting the game, we informed participants that whoever scored the most points across the five trials would win an additional $1 in prize money.

Promotion and prevention focus. To assess regulatory focus, we adapted Lockwood, Jordan, and Kunda's (2002) measure of general regulatory focus. All questionnaire items were framed in a manner to capture the participant's current mindset (e.g., "I currently see myself as someone who is more oriented toward achieving positive outcomes in my life," and "I am focused on the success I hope to achieve"). All items were on a scale of 1 (Not at all true of me) to 9 (Very true of me) ($\alpha_{Promotion} = .84$; $\alpha_{Prevention} = .73$).

Physiological arousal. To assess arousal, we obtained continuous measurements of electrocardiographic (ECG) and electrodermal activity (EDA) using a Biopac MP150 system (Biopac Systems Inc., Goleta, CA). Heart rate (HR), derived from ECG, and magnitude of skin

[7] Only 11 out of 149 participants went past the 28 card limit (4 from the non-rival condition and 7 from the rival condition). Excluding these participants from analysis does not change our results. None of the participants went past the 28 card limit twice.

[8] Every participant reached the fourth card during this round.

conductance response (SCR), derived from EDA, are widely used physiological measures of arousal (Akinola, 2010; Figner & Murphey, 2011). HR was calculated using Acqknowledge software (Biopac Systems Inc., Goleta, CA), whereas EDA was calculated following steps outlined by Figner and Murphey (2011) (see Appendix for additional details).[9]

Results

Suspicion Check and Removal of Participants. Upon conclusion of the experiment we asked participants an open-ended question: "Today's experiment was testing a new set of procedures. Did you notice anything odd or out of the ordinary?" Five participants in the rivalry condition indicated suspicion regarding the confederate (e.g., "I don't think my opponent was a real Arizona State fan"), and were therefore excluded from analysis. One participant from the control condition was removed due to equipment failure (i.e., computer restarted). Following standard procedures, we also omitted participants who were missing all of their physiological data because of recording difficulties (e.g., sensors fell off). This resulted in the removal of six participants (two from the rivalry condition, and four from the control condition), leaving a final dataset of 137 participants (68 in the rivalry condition; 77 females). Including the 12 participants who displayed suspicion or experienced equipment failures does not change the interpretation of our statistical tests for our dependent variable or mediators. Descriptive statistics and correlations are reported in Table 4.

Insert Table 4 about here

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[9] We also collected baseline and post-treatment measures of testosterone and cortisol to ascertain whether or not rivalry exerted a strong effect on these physiological measures. The variance in these measures was high, and we found no significant results. In light of how the literature likely over-states the influence of hormonal effects due to publication bias, we hope this null finding provides an important instance of when competition may not influence hormone levels.

Risk-Taking. Supporting Hypothesis 1, participants who competed against a rival exhibited greater risk-taking behavior than did those who competed against a non-rival (cards turned over: $M = 80.97$, $SD = 15.54$ vs. $M = 69.39$, $SD = 17.96$; $t(135) = 4.03$, $p < .001$, $d = .68$). This effect held in a regression after including a dummy variable for gender (0 = Male, 1 = Female; $\beta_{Rivalry} = .33$, $p < .001$; $\beta_{Gender} = .027$, $p = .742$). There was no significant interaction between rivalry and gender.

Mediation. We tested for mediation via promotion mindset and physiological arousal. This was done with a set of bias-corrected bootstrap mediation tests using the PROCESS macro in SPSS (Hayes, 2013; Preacher & Hayes, 2004).

Supporting Hypothesis 2, Condition (Non-rival competition = 0, Rivalry = 1) significantly predicted an increase in promotion mindset ($\beta = .32$, $p < .001$; see Table 5). Promotion focus in turn predicted the number of cards turned over ($\beta = .23$, $p = .006$). The bias-corrected bootstrapped confidence interval of the indirect effect of condition on cards overturned via promotion focus did not contain zero (95% bias-corrected confidence interval = [.52, 5.64]), and this effect held when controlling for gender as a dummy variable (95% bias-corrected confidence interval = [.57, 5.89]). Thus, increased promotion mindset mediated the relationship between rivalry and risk-taking, supporting Hypothesis 3. We did not find evidence of rivalry affecting prevention focus ($\beta = -.01$, $p = .939$), nor did we find an interaction between gender and rivalry in predicting promotion focus ($\beta = .11$, $p = .684$).

To test Hypotheses 4 and 5 (mediation via arousal), we examined average heart rate (HR) and skin conductance response (SCR) during the critical time period that began immediately after completion of the writing prime and ended at the end of the participant's turn in the CCT game. We did not include arousal after participants completed the game because this would

capture arousal after the measurement of our dependent variable. To control for individual differences in baseline arousal, we entered the participant's average HR or SCR during the 30 second baseline as a covariate (see also Townsend, Major, Sawyer, & Mendes, 2010).[10] Thus, the following analyses examine differences in HR or SCR between the baseline and critical period.

Participants in the rivalry condition displayed a significantly greater increase in HR during the critical period than participants in the non-rival competition condition ($\beta = .23$, $p < .001$; $M_{\text{Baseline - Rivalry}} = 79.96$, $SD_{\text{Baseline - Rivalry}} = 11.07$, $M_{\text{Baseline - Control}} = 81.33$, $SD_{\text{Baseline - Control}} = 10.06$; $M_{\text{Post-Treatment - Rivalry}} = 88.35$, $SD_{\text{Post-Treatment - Rivalry}} = 10.83$, $M_{\text{Post-Treatment - Control}} = 84.23$, $SD_{\text{Post-Treatment - Control}} = 10.39$), and this increased HR significantly predicted the number of cards overturned ($\beta = .29$, $p = .011$). The bias-corrected confidence interval of the indirect effect of condition on cards overturned via heart rate change did not contain zero (95% bias-corrected confidence interval = [.95, 4.79]), and this effect held when controlling for gender as a dummy variable (95% bias-corrected confidence interval = [1.02, 5.10]). Thus, increased heart rate mediated the effect of rivalry on risk-taking.

Rivalry also predicted higher SCR during the critical period ($\beta = .19$, $p = .012$; using baseline SCR as a covariate, see also Kircanski, Lieberman, & Craske, 2012). However, SCR did not predict the number of cards selected ($\beta = -.06$, $p = .470$). Gender did not interact with condition to predict HR ($\beta = -.10$, $p = .619$) or SCR ($\beta = -.25$, $p = .332$). Thus, supporting Hypothesis 4, using our two physiological arousal measures of HR and SCR, we find that competing against a rival increases arousal. We find partial support for Hypothesis 5 in that increased HR mediated the effect of rivalry on risk-taking.

[10] Baseline average HR (HR: $t(135) = .75$, $p = .450$) and SCR did not differ between conditions ($t(135) = 1.32$, $p = .188$).

We then examined the two significant mediators, promotion mindset and arousal as measured by HR, in a simultaneous parallel mediation model (Hayes, 2013). Both indirect effects remained significant (95% confidence interval for promotion mindset = [.30, 5.14]; 95% confidence interval for arousal = [.77, 4.42]), suggesting that changes in psychological orientation and physiological arousal served as simultaneous and independent meditational pathways from rivalry to risk-taking (see Figure 2).[11]

Insert Table 5 about here

Insert Figure 2 about here

General Discussion

Across two studies involving archival data from professional athletic teams and an experiment involving face-to-face competition, we found that risk-taking varies according to the relationships between co-actors. This was true of decision-makers at the top of sports organizations (football coaches) as well as lower-level members of academic institutions. In particular, we found that interacting with a rival increases risk-taking via two independent pathways: one psychological (promotion focus) and the other physiological (arousal).

Theoretical Contributions

Our findings make two key theoretical contributions. First, we advance our understanding of the determinants of risk-attitudes and risky behavior (e.g., March & Shapira, 1987). Prior work has depicted risk attitudes as primarily a function of individual and situational factors. Risky decisions in organizations are often profoundly social, yet these social aspects of the

[11] We also examined serial mediation models (i.e., rivalry → arousal → promotion → risk; rivalry → promotion → arousal → risk) but did not find any conclusive results.

decision-making situation have received little research attention. Our results show that risk-taking can be affected by the identity of one's co-actor(s) and the relationships one has with them, thus extending the existing risk attitudes paradigm and work on the situational determinants of risk. Indeed, our work may provide an additional mechanism for why situational antecedents, such as dense competitive environments, produce greater risk-taking: the fewer and more equal the competitors are, the more possibility for rivalry relationships to develop, thus leading to greater risk-taking.

Relatedly, we contribute to research on regulatory focus (e.g., Crowe & Higgins, 1997) by applying a relational lens. We show that the presence of a co-actor can alter the focal individual's regulatory focus, as a function of the relationship with the co-actor. Similar to research on risk propensity, prior work on regulatory focus conceptualizes it as either a dispositional tendency or a state activated by non-social situational factors (e.g., experimental manipulations of texts). Furthermore, the majority of regulatory focus research has examined isolated individual decision-makers. However, decisions made in organizational contexts are rarely made in isolation of others. A relational approach to the study of regulatory focus provides the basis for a wide variety of future directions given the numerous relationships and interactive situations present in organizations, such as those between coworkers, supervisors and subordinates, and in negotiations. Given the extensive range of research on the organizational consequences of promotion mindsets (see Lanaj et al., 2012 for a review), this relationally-dependent view of regulatory focus has broad implications beyond just risk propensity.

Second, we make important contributions to rivalry theory (e.g., Kilduff et al., 2010). We document a new consequence of rivalry that is fundamental to organizational life: greater risk-taking, independent of the ethicality or expected value of the options. We also shed greater light

on the underlying psychology of rivalry by empirically linking it to increased promotion focus, thus connecting rivalry with the fundamental decision making framework of regulatory focus. In fact, we postulate that promotion focus may be a common thread that connects a range of prior findings with respect to the consequences and mechanisms of rivalry, thus helping to integrate them into a cohesive framework. Specifically, heightened promotion focus would seem to encompass the previously established mechanisms of performance goal orientations (Kilduff et al., 2016) and the outcomes of rivalry such as adoption of eager and less deliberative strategies (Converse & Reinhard, 2016), and goal-directed effort and motivation (Kilduff, 2014). Indeed, although we examined risk-taking void of unethical implications in this research, the links between rivalry and unethical behavior and rivalry and risky behavior may share a common psychological antecedent: increased promotion focus. Regulatory focus has implications for a wide-range of decisions, including many decision domains that have little direction connect with competition. As a result, these insights suggest a number of future research directions regarding the behavioral consequences of rivalry. For example, managers involved in rivalries – either with other individuals or as executives of rival organizations – may be more likely to take actions consistent with achieving their ideal outcomes. Such actions could include new product launches, market entry, making investments, joint ventures, research funding, strategic retaliation (e.g., Chen, 1996), as well as mergers and acquisitions (Gamache, McNamara, Mannor, & Johnson, 2015).

We also contribute to the rivalry literature by providing the first thorough investigation of its physiological effects. This connection of two emerging streams of research in organizational behavior (rivalry and physiology) is significant given the prevalence of rivalry, and the range of organizational outcomes tied to physiology, including work engagement, negotiation

performance, and leadership emergence (Akinola & Mendes, 2013; Heaphy & Dutton, 2008; Mehta, Mor, Yap, & Prasad, 2015; Sherman et al., 2012; Sherman, Lerner, Josephs, Renshon, & Gross, 2016). Indeed, business rivalries (e.g., rival companies such as Apple vs. Microsoft, or rival employees vying for promotions) might be even more potent than sports rivalries due to the fact that sports rivalries are based on one to two encounters per year but business rivalries generally involve continual competition. Thus, as an example implication of our findings, business rivalries might lead to chronic levels of physiological activation, which could cause detrimental long-term health effects (c.f., Melamed, Ugarten, Shirom, Kahana, Lerman, & Froom, 1999). In connecting physiological arousal and risk taking, we also build on the competitive arousal literature (Ku et al., 2004; Malhotra, 2011). First, we identify the relationship between competitors as a unique antecedent to arousal that is distinct from situational factors identified in prior work, such as time pressure or the number of competitors. Second, in contrast to prior work that discussed arousal only theoretically, we are the first to measure physiological arousal in competitive settings.

Organizational and Practical Implications

Our findings allow us to make informed speculations on the implications of rivalry for both organizational performance (Bromiley, 1991; Hayward & Hambrick, 1997; March & Shapira, 1987) and the performance of individuals within organizations (e.g., Coates, Gurnell, & Rustichini, 2009; Coates & Herbert, 2008). We expect the relationship between risk-taking and performance to critically depend upon the decision-making context. For example, for 'high-reliability' organizations, whose priority is to avoid mistakes (Weick, Sutcliffe, & Obstfeld, 1999), risky or careless decisions can have dangerous consequences for an organization's performance. Thus, inter-organizational rivalry could be a destructive force for such

organizations. On the other hand, if organizational performance is contingent on the development of novel innovations, such as technology, rivalry induced risk attitudes could benefit performance by encouraging greater experimentation and exploration (March, 1991). For example, the nearly 50-year-old rivalry between chipmakers Intel and AMD has been argued to be a major driving force in computer chip innovation.[12]

Risk-taking can similarly be negatively or positively related to individual-level performance. It may be harmful if performance is contingent on consistent, mistake-free output, such as accounting or certain legal jobs. On the other hand, risk-taking, up to a point, has been shown to be beneficial to individual stock traders (Coates et al., 2008) and it should also benefit jobs that demand creativity. Indeed, the drive to succeed sparked by inter-individual rivalry relationships appears to have contributed to important innovations such as the light bulb (e.g., Edison versus Tesla; Jonnes, 2004) and vaccines for rabies and anthrax (e.g., Koch versus Pasteur; Goetz, 2014).

Furthermore, the performance implications and desirability of increased risk-taking likely vary according to the baseline level of risk currently being taken. Among individual stock traders, risk-taking is already encouraged because it is generally positively related to performance (Coates et al., 2008). In this case, for those traders already highly prone to taking risks, rivalry could be detrimental because further increasing risk could cause these individuals to overextend themselves. Indeed, such overextensions by traders and financial institutions resulted in over-leveraged positions prior to the 2007-2008 financial crisis, ultimately harming firm performance. This example also illustrates the fact that risk-taking that may be beneficial in the short-term can be harmful in the long-term. On the other hand, when there is too little risk-taking, rivalry-induced risk-taking could be beneficial. In the case of clinical research, firms and

[12] https://www.pastemagazine.com/articles/2016/07/amd-vs-intel-the-truth-behind-techs-oldest-compute.html

individuals are lamented to be too risk-averse (Deakin, Alexander, & Kerridge, 2009), thus stunting overall scientific progress. Thus, rivalry in this context might serve to jumpstart risk-taking that is needed for innovation.

It is also possible that rivalry could benefit organizational performance by promoting certain proactive behaviors that arise from increased risk-attitudes. For example, voice behaviors, which are traditionally conceptualized as a risky decision (e.g., Morrison, 2011), can improve firm performance by encouraging constructive change oriented communication (LePine & Van Dyne, 2001). Relatedly, employees sometimes avoid proactive behaviors due to the social and career risks, which arise from behaving out of expected norms (Grant & Ashford, 2008). When rival relationships are salient, the consequent increased risk-attitudes could encourage employees to discount social risks, thereby encouraging counter-normative behaviors which can ultimately aid performance. Of course, certain counter-normative behaviors can be detrimental to organizations (Lee & Allen, 2002), so this would need to be managed with caution.

Overall, our findings provide managers with critical information that enables them to better evaluate whether rivalry will be beneficial or harmful for the performance of their organizations and employees. In contexts where increased risk-taking is desired, managers could consider designing jobs to encourage rivalry relationships among employees (e.g., repeatedly pitting evenly-matched employees against one another), socializing incoming employees to historic company rivalries, and regularly emphasizing comparisons to these rival organizations. In contexts in which reliability is more important, or risk-taking is currently too high, managers would be wise to avoid taking such actions, and might intervene specifically to remove any conditions ripe to the formation of rivalry (e.g., public performance rankings that provide the basis for repeated competition). Thus, rivalry can be seen as a lever that managers can push or

pull, depending upon whether they want to increase or decrease risk-taking among their employees. Overall, managers who can combine accurate assessment of the desirability of risk-taking within their organizations with effective management of rivalry should find themselves administering higher-performing organizations.

Future Directions

Our findings inform a number of future directions. First, future work could expand our understanding of the relational predictors of risk-taking and regulatory focus. For example, interacting with coworkers characterized by positive relational ties could induce positive affect and foster a promotion focus (Carver, 2006; Carver & White, 1994). This mechanism could account for the finding that a positive workplace fosters greater commitment and creativity, both of which are outcomes of increased promotion focus (Lanaj et al., 2012). Related investigations could explore whether or not individuals become more risk-seeking when they interact with a high status peer due to the arousal that arises from evaluation apprehension (Aiello & Douthitt, 2001), or from interacting with someone whom the decision-maker has ambivalent feelings toward (Maio, Greenland, Bernard, & Esses, 2001). Future work could examine the complementarities between relational antecedents and prior dispositional or situational antecedents. For example, individuals who are naturally more prone to social comparison, or exposed to trash-talking (Yip, Schweitzer, Nurmohamed, 2017) might be prone to rivalry and its related arousal or promotion focused effects.

Second, we only examined risk-taking in high-arousal settings that involved rapid decisions. A natural follow-up would be to examine whether the effects of relationships on risk-taking might be reduced if decision-makers make decisions ahead of time or over a longer period of time ("colder" decision making contexts). For example, if rival bidders in an auction commit

to a strategy ahead of time, it is possible that rivalry would have less of an effect on risk taking because physiological arousal would likely be lower when the decisions were made. This could have practical implications – for example, in a business setting, rival short-term traders might reduce risk-taking by pre-determining maximum investment amounts or leverage positions, as opposed to continually making new investment decisions during the trading day. Conversely, future work should explore whether or not exposure to a rival in one setting might trigger arousal that influences behavior is a second, unrelated setting, in much the same way that incidental emotions influence judgment and behavior (e.g., Dunn & Schweitzer, 2005; Lerner & Keltner, 2001).

Third, our research also has implications for future research into the specific link between rivalry and risk-taking. Recent research suggests that promotion focused individuals switch from a risk-seeking to a risk-averse strategy when they transition from a neutral state to the domain of gains (Zou et al., 2014). As a result, individuals competing against a rival may switch from risk-seeking behaviors when the competition is close to risk-averse strategies when they are comfortably ahead of their rival. In fact, we conducted supplemental analyses of our NFL data, and find partial support for this idea. We created a dummy variable to represent when a team was comfortably ahead or not (1 = Up by 14 or more points; 0 = Otherwise).[13] An interaction between this dummy variable and our rivalry measure revealed a significant interaction, $\beta = -.192$, $p = .036$, for fourth down attempts. Independent regressions suggested rivalry has no effect on fourth down decisions when teams were ahead by 14 or more points ($\beta = -.075$, $p = .485$), but a strong positive effect when teams were not comfortably ahead ($\beta = .055$, $p = .001$). However,

[13] We chose the 14-point cutoff to represent a comfortable lead because, within our sample, teams with a 14-point advantage win 92% of the time. To obtain a full table containing the probability of winning, please contact the first author.

we did not find this interaction in our analyses of two-point conversion decisions (β = .042, p = .381).

In another supplemental analysis we found that competing against a rival increased the number of fake field goals attempted (β = 1.40, p = .024), which raises the possibility that competitors may anticipate a greater need to surprise their rivals, perhaps due to the greater familiarity that exists between rivals. We call for future research to investigate both the link between competitive position and risk-taking and the familiarity with an opponent and risk-taking.

Fourth, additional research should explore the extent to which rivalry generalizes across contexts and populations. Our theory of rivalry and risk-taking broadly encapsulates both actors (e.g., managers, employees, coaches, players; Study 1) and observers (e.g., fans, consumers; Study 2) of organizational rivalry. Although we find consistent results across our two studies, future research should explore potential boundary conditions and moderators of rivalry. For example, compared to third party observers (e.g., fans or consumers), actors deeply embedded in an organization (e.g., managers or employees) might view their membership in their organizations as less permeable, and thus may react with greater identification when their social group is threatened (e.g., Tajfel & Turner, 1979). In addition, our empirical contexts involved organizational-level rivalries between sports organizations and academic institutions. Future work should examine rivalry in other organizational domains and extend our findings to intra-team and intragroup rivalries. For example, teams characterized by high intragroup rivalry may be characterized by a promotion focus, struggle to collaborate on interdependent tasks, yet be highly creative and exhibit high levels of divergent thinking (Friedman & Förster, 2001). We hope that our work will inspire scholars to explore these many potential avenues of research.

Conclusion

Relationships are a fundamental part of organizational life. We investigate a particularly important type of relationship, rivalry, and show that it changes how we compete and how we make decisions. Rivalry promotes greater risk-taking by triggering a promotion mindset and higher physiological arousal. Thus, individuals and organizations should be especially mindful of their decision making when competing against rivals. How much risk we are willing to take on may have more to do with the relationships we have with our competitors than we think.

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Table 1
Study 1 correlations for 4th down attempts

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1	Fourth Down Attempt	0.12	0.33	1.000											
2	Rivalry - Aggregate	0.04	0.14	0.009	1.000										
3	Rivalry - NFL	0.05	0.22	0.006	0.91**	1.000									
4	Rivalry - Google	119.20	522.64	0.009	0.774**	0.523**	1.000								
5	Rivalry - Mturk	2.14	6.18	0.008	0.906**	0.699**	0.700**	1.000							
6	Home Team	0.49	0.50	-0.002	0.006	0.005	0.005	0.006	1.000						
7	Conference Opponent	0.75	0.43	-0.003	0.167**	0.124**	0.131**	0.189**	0.004	1.000					
8	Division Opponent	0.35	0.48	0.004	0.332**	0.226**	0.273**	0.398**	0.000	0.428**	1.000				
9	Division Crowding	0.66	0.89	-0.020**	-0.007	-0.005	-0.006	-0.008	-0.012*	0.012*	0.001	1.000			
10	Rank of Focal Team	16.94	9.23	0.020**	-0.064**	-0.048**	-0.031**	-0.085**	0.027**	-0.006	0.011*	-0.02**	1.000		
11	Relative Difference in Rank	-0.49	13.12	-0.029**	0.004	0.006	0.002	0.001	-0.038**	0.000	-0.001	0.010	-0.714**	1.000	
12	Absolute Difference in Rank	10.88	7.36	0.012*	-0.009	-0.029**	0.023**	0.001	0.003	0.039**	0.064**	-0.066**	0.028**	-0.047**	1.000
13	Week	9.18	4.98	0.028**	0.048**	0.040**	0.040**	0.047**	0.000	0.019**	0.056**	-0.547**	0.006	0.000	0.017**
14	Yardline	50.29	24.67	0.229**	-0.003	-0.002	-0.002	-0.005	0.029**	0.004	-0.002	-0.008	-0.043**	0.05**	-0.002
15	Yards to First Down	7.61	5.68	-0.204**	0.005	0.011*	-0.004	0.000	-0.018**	-0.006	0.001	0.021**	0.026**	-0.033**	0.002
16	Gap in Score	-0.87	10.79	-0.201**	0.000	0.003	0.001	-0.003	0.142**	0.000	-0.003	-0.003	-0.177**	0.249**	-0.010
17	Gap in Score Squared	117.19	220.41	0.163**	-0.010	-0.027**	0.014**	0.003	-0.009	-0.010	0.011*	-0.014**	0.004	-0.018**	0.057**
18	Time Remaining in Half	13.56	8.77	-0.186**	-0.007	-0.005	-0.005	-0.008	-0.013*	0.001	-0.005	-0.008	0.004	-0.007	0.001
19	Quarter	2.59	1.14	0.193**	0.001	-0.002	0.000	0.005	0.014**	-0.004	0.002	-0.004	-0.009	0.013*	0.004

Note: n = 35870, $|r| \geq .011$ significant at .05 level, $|r| > .014$ significant at .01 level

		13	14	15	16	17	18	19
1	Fourth Down Attempt							
2	Rivalry - Aggregate							
3	Rivalry - NFL							
4	Rivalry - Google							
5	Rivalry - Mturk							
6	Home Team							
7	Conference Opponent							
8	Division Opponent							
9	Division Crowding							
10	Rank of Focal Team							
11	Relative Difference in Rank							
12	Absolute Difference in Rank							
13	Week	1.000						
14	Yardline	0.011*	1.000					
15	Yards to First Down	-0.012*	-0.249**	1.000				
16	Gap in Score	-0.001	0.026**	-0.065**	1.000			
17	Gap in Score Squared	0.020**	0.011*	0.011*	-0.089**	1.000		
18	Time Remaining in Half	0.008	-0.117**	0.008	0.000	-0.137*	1.000	
19	Quarter	0.000	0.050**	0.010	0.017**	0.310**	-0.389**	1.000

Table 2
Study 1 correlations for 2 point attempts

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1	2pt Attempt	0.05	0.22	1.000											
2	Rivalry – Aggregate	0.04	0.13	0.014	1.000										
3	Rivalry – NFL	0.05	0.21	0.017	0.913**	1.000									
4	Rivalry – Google	107.30	481.66	0.007	0.753**	0.508**	1.000								
5	Rivalry – Mturk	2.07	5.98	0.009	0.906**	0.706**	0.668**	1.000							
6	Home Team	0.53	0.50	-0.025**	-0.013	-0.009	-0.016	-0.013	1.000						
7	Conference Opponent	0.75	0.43	0.001	0.165**	0.120**	0.128**	0.190**	-0.013	1.000					
8	Division Opponent	0.35	0.48	0.001	0.299**	0.186**	0.260**	0.370**	-0.016	0.422**	1.000				
9	Divisional Crowd	0.64	0.87	0.002	-0.011	-0.007	-0.022*	-0.006	-0.002	0.015	-0.003	1.000			
10	Rank of Focal Team	15.33	9.13	0.044**	-0.059**	-0.045**	-0.007	-0.088**	0.044**	0.005	0.010	0.009	1.000		
11	Absolute Difference in Rank	1.81	13.12	-0.041**	-0.011	-0.011	-0.013	-0.005	-0.060**	-0.001	0.012	-0.008	-0.706**	1.000	
12	Relative Difference in Rank	10.99	7.39	-0.005	-0.029**	-0.050**	0.024*	-0.024*	-0.012	0.040**	0.069**	-0.072	-0.090**	0.153**	1.000
13	Week	9.21	4.94	-0.008	0.045**	0.043**	0.040**	0.033**	-0.001	0.016	0.056**	-0.521**	-0.007	0.004	0.024*
14	Gap in Score	5.30	10.86	-0.175**	-0.013	-0.018	0.002	-0.009	0.146**	-0.017	-0.001	-0.015	-0.173**	0.249**	0.029**
15	Gap in Score Squared	146.01	237.68	-0.030**	-0.022*	-0.033**	0.003	-0.013	0.059**	-0.032**	-0.008	-0.016	-0.077**	0.103**	0.059**
16	Time Remaining in Half	12.98	8.70	-0.131**	-0.007	-0.015	0.002	0.002	0.026**	0.006	0.014	-0.005	-0.016	0.028**	0.002
17	Quarter	2.58	1.11	0.243**	0.001	0.013	-0.009	-0.009	-0.038**	-0.019*	-0.008	0.021*	0.026**	-0.040**	-0.023*

Note: n = 11076, $|r| \geq .019$ significant at .05 level, $|r| > .025$ significant at .01 level

		13	14	15
1	2pt Attempt			
2	Rivalry – Aggregate			
3	Rivalry – NFL			
4	Rivalry – Google			
5	Rivalry – Mturk			
6	Home Team			
7	Conference Opponent			
8	Division Opponent			
9	Divisional Crowd			
10	Rank of Focal Team			
11	Absolute Difference in Rank			
12	Relative Difference in Rank			
13	Week	1.000		
14	Gap in Score	0.006	1.000	
15	Gap in Score Squared	0.015	0.471**	1.000
16	Time Remaining in Half	0.009	0.068**	-0.081**
17	Quarter	-0.022*	-0.068**	0.248**

Table 3
Study 1 rare-events logistic regression models for aggregate rivalry measure

Variable	Model 1 Fourth down attempt	Model 2 Two-point attempts	Model 3 Fourth down attempt	Model 4 Two-point attempts
Rivalry	0.0433*** (0.0126	0.1005*** (0.0253)	0.0555*** (0.0135)	0.0846* (0.0378)
Conference opponent (0 or 1)			-0.0277 (0.0181)	0.0069 (0.0559)
Division opponent (0 or 1)			0.0106 (0.0184)	-0.0288 (0.0604)
Absolute Rank difference between teams			0.0332† (0.0173)	0.0379 (0.0505)
Relative Rank difference between teams			0.0658* (0.0287)	0.1592† (0.0838)
Crowding			-0.0077 (0.0233)	-0.0472 (0.0541)
Week of the season			0.0889*** (0.0259)	-0.0363 (0.0534)
Offensive Yardline			0.5847*** (0.0188)	
Yards to first down			-0.9481*** (0.0538)	
Gap in score			-0.6883*** (0.0395)	-0.6280*** (0.0659)
Gap in score squared			0.1534*** (0.0426)	-0.3830*** (0.0730)
Home Team			0.1439*** (0.0344)	0.0480 (0.1068)
Time Remaining			-0.9461*** (0.0483)	-0.4604*** (0.0873)
Quarter dummies			Included	Included
Rank dummies			Included	Included
Yearly dummies	Included	Included	Included	Included
Team dummies	Included	Included	Included	Included
N	35870	11076	35870	11076
Psuedo R^2	0.0051	0.0194	0.2831	0.2694

† < .10; * < .05; ** < .01; * < .001, two-tailed tests.**
Standard errors are in parentheses. Clustered at team-level.

Table 4
Study 2 Correlations

		M	*SD*	1	2	3	4	5	6	7	8	9
1.	Heart Rate – Time 1	80.66	10.56	1								
2.	SCR – Time 1	0.01	0.02	.089	1							
3.	Heart Rate – Time 2	86.28	10.77	.673**	-.003	1						
4.	SCR – Time 2	0.02	0.02	.042	.448**	-.001	1					
5.	Rivalry	0.50	0.50	-.065	-.113	.192*	.139	1				
6.	Cards Selected	75.14	17.72	-.064	.163	.178*	.089	.328**	1			
7.	Promotion Focus	7.49	1.37	-.077	.057	.027	.072	.321**	.316**	1		
8.	Prevention Focus	5.38	1.58	.000	.001	.063	-.164	-.007	-.129	.053	1	
9.	Gender (1 = Female)	0.56	0.50	.367**	-.062	.203*	.078	.023	.034	-.145	-.057	1

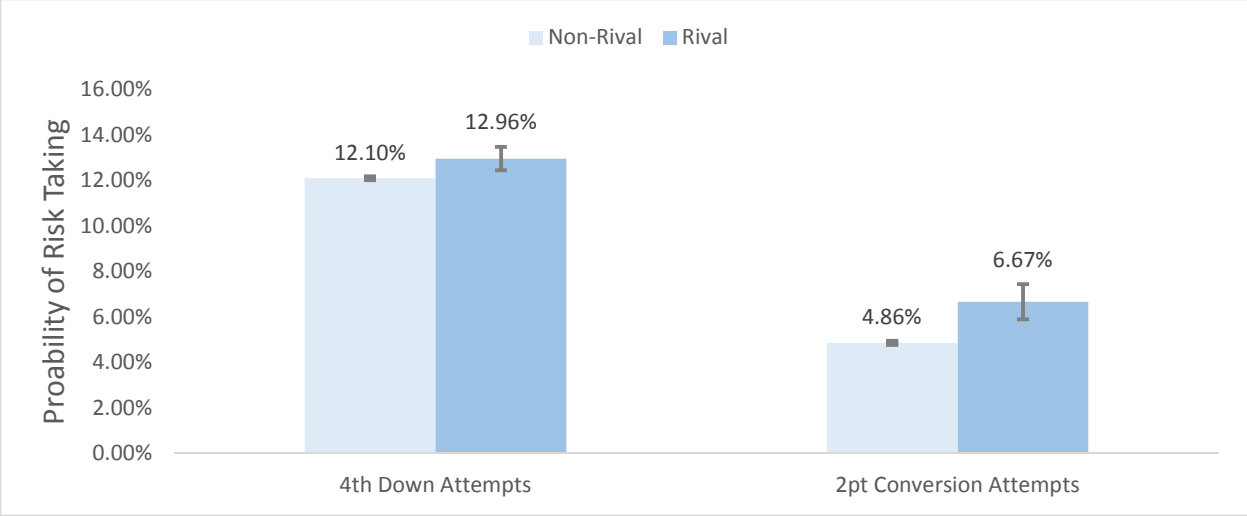
Note: n = 137, | r | > .168 significant at .05 level, | r | > .220 significant at .01 level

Table 5
Study 2 Regressions

Variables	Model 1: Promotion Focus	Model 2: Cards	Model 3: Heart Rate – Time 2	Model 4: Cards	Model 5: SCR – Time 2	Model 6: Dual Mediator
Rivalry	.321**	.252**	.237**	1.42**	.193*	.197*
Promotion Focus		.235**				.212*
Heart Rate – Time 1			.688**	-.245*		-.190†
Heart Rate – Time 2				.293*		.262*
SCR – Time 1					.470**	
R^2	.103**	.157**	.508**	.152**	.238**	.191**

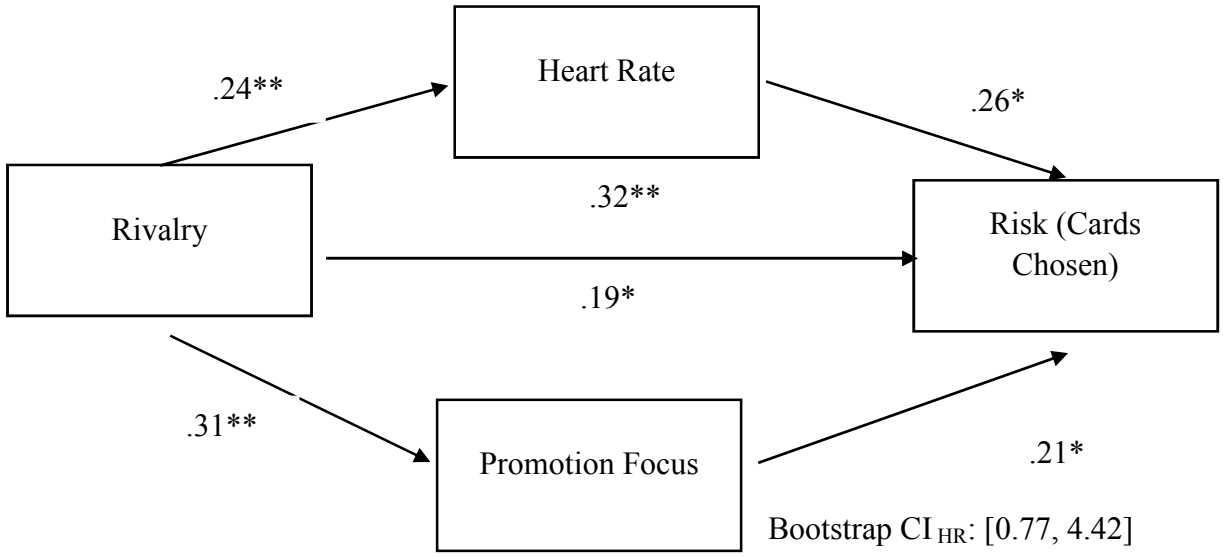
Note: n = 137, **† < .10; * < .05; ** < .01; *** < .001, two-tailed tests.**
Standardized coefficients reported

Figure 1
Predicted Probability of Risk Taking using Binary (NFL.com) Measure of Rivalry



Note. The standard error bars for the rivalry group are larger due to the relatively smaller sample size compared to non-rival groups.

Figure 2
Study 2: Parallel mediation of rivalry on risk taking by promotion focus and physiological arousal (heart rate)



Bootstrap CI $_{HR}$: [0.77, 4.42]

Bootstrap CI $_{Prom}$: [.30, 5.14]

HR During baseline as covariate

+ < .10, * < .05, ** < .01

APPENDIX
Details on Physiological Measures from Study 2

Our ECG measurements were recorded at 1kHZ sampling rate using a standard lead-2 placement and analyzed offline. We used Acqknowledge software (Biopac Systems Inc., Goleta, CA) to apply a 1 Hz low-pass filter to correct for baseline drift, and visually inspected and corrected the data for artifacts.[14] If artifacts were detected, the artifact was removed via interpolation (for similar method, see Diamond, Hicks, Otter-Henderson, 2011; Kogan et al., 2014). Our EDA measurements were recorded at 1 HZ sampling rate via electrodes placed on palmer surface of the medial phalanx (fingertips) of the index and middle fingers of the participant's non-dominant hand. Following the steps outlined by Figner and Murphey (2011), we obtained SCR from the raw EDA data by applying a 0.5 Hz high-pass filter and used custom Python code to calculate the area bounded by the SCR curves.

[14] When we do not correct for baseline drift in the ECG data, our results, reported below, do not change significance at the .05 level.

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